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ACQUISITION OF THE WIDE AREA MUNITION

Report No. D-2002-011

October 24, 2001

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Abstract The Army initiated the Wide Area Munition program in November 1986, to be a smart, autonomous, top-attack, anti-tank munition to neutralize armored combat vehicles (track and heavy wheeled) at a standoff distance. The Wide Area Munition uses acoustic and seismic sensors in its ground platform to detect, track, and classify potential targets, and then launch an infrared detecting submunition over the top of the selected tracked target. Once above the target, it fires an explosively formed penetrator intended to neutralize the lightly armored top-side of most combat vehicles. The program office estimates that the system will cost about \$335 million in research, development, test, and evaluation funds and about \$1.7 billion in procurement. The Army Acquisition Executive is the milestone decision authority for this program that the Army manages as an Acquisition Category II major acquisition program.		
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Acronyms

ATEC	Army Test and Evaluation Command
ROC	Required Operational Capability
WAM	Wide Area Munition



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October 24, 2001

MEMORANDUM FOR UNDER SECRETARY OF DEFENSE FOR ACQUISITION,
TECHNOLOGY, AND LOGISTICS
AUDITOR GENERAL, DEPARTMENT OF THE ARMY

SUBJECT: Audit Report on the Acquisition of the Wide Area Munition
(Report No. D-2002-011)

We are providing this report for your review and comment. We considered comments from the Under Secretary of Defense for Acquisition, Technology, and Logistics, and the Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) when preparing the final report.

DoD Directive 7650.3 requires that all recommendation be resolved promptly. The Under Secretary of Defense for Acquisition, Technology, and Logistics did not provide a completion date for implementing Recommendation 1. Also, the Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) comments were not fully responsive concerning Recommendation 2. We request additional comments on Recommendations 1 and 2 by December 10, 2001.

We appreciate the courtesies extended to the audit staff. For additional information on this report, please contact Mr. John E. Meling at (703) 604-9091 (DSN 664-9091) (jmeling@dodig.osd.mil) or Mr. Douglas P. Neville at (703) 604-9076 (DSN 664-9076) (dpneville@dodig.osd.mil). See Appendix G for the report distribution. Audit team members are listed inside the back cover.

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Report No. D-2002-011

(Project No. D2001AE-0011)

October 24, 2001

Acquisition of the Wide Area Munition

Executive Summary

Introduction. The Army initiated the Wide Area Munition program in November 1986, to be a smart, autonomous, top-attack, anti-tank munition to neutralize armored combat vehicles (track and heavy wheeled) at a standoff distance. The Wide Area Munition uses acoustic and seismic sensors in its ground platform to detect, track, and classify potential targets, and then launch an infrared detecting submunition over the top of the selected tracked target. Once above the target, it fires an explosively formed penetrator intended to neutralize the lightly armored top-side of most combat vehicles. The program office estimates that the system will cost about \$335 million in research, development, test, and evaluation funds and about \$1.7 billion in procurement. The Army Acquisition Executive is the milestone decision authority for this program that the Army manages as an Acquisition Category II major acquisition program.

Objectives. The audit objective was to evaluate the overall management of the Wide Area Munition program. Because the program was in the engineering and manufacturing development phase, we determined whether management was cost-effectively developing and readying the system for the production phase of the acquisition process. In addition, we evaluated the management control program as it related to our audit objective. The Wide Area Munition program consists of two versions: the basic Wide Area Munition (Hornet) and the product improvement program (Advanced Hornet).

Results. The Army and the Wide Area Munition Program Manager did not effectively manage the expenditure of \$305 million in research, development, test and evaluation funds through FY 2001 to ready the Hornet for production and deployment, and to conduct the engineering and manufacturing development phase for the Advanced Hornet. Specifically,

- the Army and program office supported the continuation of the program even though unit costs had increased by 330 percent and the schedule had slipped by more than 5 years since program inception;
- the Army allowed changes to the Hornet operational performance requirements below those originally established and acceptable by the user;
- the Army independent test organization determined that the Hornet was not operationally effective based on test results that showed that the Hornet met only 5 of the 15 operational performance requirements;
- the Army independent test organization did not perform necessary tests before production and deployment of the Hornet to prove that typical Army users could safely store, transport, handle, and employ the Hornet under realistic conditions, such as effects of battlefield noise, even though the Hornet uses acoustic and seismic sensors to detect targets;
- the Army did not revalidate the rationale for the continued development of the Wide Area Munition as the related threat had reduced by more than 80 percent since the program began more than 12 years ago;

- the program manager did not properly develop and update the test and evaluation master plan and the acquisition strategy to manage the Wide Area Munition program effectively and make informed decisions; and
- the program manager did not recommend that the Defense Acquisition Executive oversee the Wide Area Munition program as required, even though the program procurement costs will exceed \$3 billion.

As a result, the Army has obligated about \$305 million for a weapon system that, after 12 years of development effort, has yet to demonstrate through developmental testing or a dedicated phase of operational test and evaluation, the ability to satisfy minimum acceptable operational performance requirements. Further, if the program continues, the Army plans to obligate another \$30.7 million to complete development efforts and \$237.6 million in procurement funds through FY 2007. Of the \$237.6 million, the program manager plans to spend \$23.2 million to procure 107 Hornets in excess of the 270 required by the 82nd Airborne Division for its basic load, the only unit scheduled to receive the Hornet. Implementing the recommendations would allow the Army to put the \$268.3 million of remaining funds programmed for the Wide Area Munition to better use. See the Finding section for a discussion of the audit results. The Finding section provides details on the audit results. Appendix A summarizes the review of the management control program.

Summary of Recommendation. We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics conduct a special review of the Wide Area Munition program to address the issues identified during the audit and to determine whether the current program should continue. We also recommend that the Wide Area Munitions Program Manager immediately validate Hornet requirements of the 82nd Airborne Division and adjust Hornet procurement quantities accordingly.

Management Comments. We received comments from the Director, Strategic and Tactical Systems, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics and the Army. The Director, Strategic and Tactical Systems stated that the Deputy for Munitions would perform the recommended review of the Wide Area Munition program that would focus on requirements, program acquisition category, and viability of Army acquisition plans for the Advanced Hornet. The Army disagreed with the finding and stated that it had revalidated the need for 377 Hornets. A discussion of the management comments is in the Finding section and Appendix F, and the complete text is in the Management Comments section.

Audit Response. The comments from the Director, Strategic and Tactical Systems were partially responsive. In response to the final report, we ask that the Director, Strategic and Tactical Systems reconsider his position on reviewing the Hornet safety confirmation, the threat, and the conditional materiel release and related get-well plan as part of the Wide Area Munition program review. The comments from the Army were not fully responsive. We stand by our finding statements. In revalidating the number of Hornets needed, the Army ignored the fact that the 82nd Airborne Division, recipient of all Hornet units, would rather use other weapon systems in the Army inventory to defeat the threat because of Hornet performance limitations. In response to the final report, we ask that the Army reconsider the need to invest in more than 270 Hornet units that equates to the basic load of the 82nd Airborne Division. Accordingly, we request that the Director, Strategic and Tactical Systems, and the Army provide additional comments by December 10, 2001.

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Basic Wide Area Munition (Hornet)

Source: Armament Research and Development Evaluation Center

Background

The Army initiated the Wide Area Munition (WAM) program in November 1986. The Deputy Chief of Staff for Operations approved the required operational capability (ROC) document for the WAM on February 6, 1990, that specified the development of three WAM variants: hand-emplaced; volcano-delivered; and deep attack Army Tactical Missile System delivered. Since 1990, the Army has funded development efforts for two versions of the hand-emplaced WAM: the basic WAM (Hornet) and the WAM product improvement program (Advanced Hornet). On February 13, 1990, the Deputy Commander for Armaments and Munitions approved the WAM to enter into the engineering development phase of the acquisition process. The program office did not issue the development contract for the Advanced Hornet until June 1996.

The Army is designing the hand-emplaced WAM as a smart, autonomous, top-attack, anti-tank munition to neutralize armored combat vehicles (track and heavy wheeled) from a standoff distance. It is a self-contained, 35-pound weapon system that is designed to detect, identify, track, engage, and neutralize armored vehicles within a 100-meter attack radius. It is to be carried and set up by a single soldier. When set up, the employing soldier will arm the WAM either manually or by remote control.

After it is armed, the WAM enters a power-cycling standby mode to conserve energy until its acoustic and seismic sensors detect approaching vehicles. The WAM is to then engage the selected target by tilting its launch mechanism in the target direction and firing an infrared-equipped, top-attack munition called a sublet. When the sublet detects a target's infrared signature, the sublet fires a top-attack penetrator slug intended to defeat the lightly armored top-side of most combat vehicles. If the sublet does not detect any suitable target, it is to fire its top-attack penetrator after a predetermined time-out has expired, effecting a self-destruct.

On June 18, 1996, the Program Executive Officer, Armored Systems Modernization (then the milestone decision authority)¹, approved the Hornet for low-rate initial production and authorized the continued development of the Advanced Hornet. The WAM Program Office, in its acquisition strategy, showed that the Army planned to procure 33,991 WAM units for an estimated program cost of about \$2 billion. However, Army budget documentation shows that the approved Army acquisition objective is 53,376 WAM units. As of June 2001, the Army had procured 110 of the 377 Hornets under low-rate initial production. The remaining WAM procurement quantity of 33,614 units will be in the Advanced Hornet configuration. The Army manages the WAM program as an acquisition category II major acquisition program. Appendix B provides definitions of technical terms used in this report.

¹On November 27, 2000, the milestone decision authority was changed to the Army Acquisition Executive.

Objectives

The audit objective was to evaluate the overall management of the WAM program. Because the program was in the engineering and manufacturing development phase, we determined whether management was cost-effectively developing and readying the system for the production phase of the acquisition process. In addition, we evaluated the management control program as it related to our audit objective. See Appendix A for a discussion of the audit scope and methodology, the review of the management control program, and prior coverage related to the audit objectives.

Program Management of the Wide Area Munition

The Army and the WAM Program Manager did not effectively manage the program to ready the Hornet for production and deployment, and to conduct the engineering and manufacturing development phase for the Advanced Hornet. Specifically,

- the Army and program office supported the continuation of the program even though the WAM program experienced significant unit cost increases and schedule slippages;
- the Army allowed changes to the Hornet operational performance requirements below those originally established and acceptable by the user;
- the Army independent test organization determined that the Hornet was not operationally effective;
- the Army independent test organization did not perform necessary tests before production and deployment of the Hornet to prove that typical Army users could safely store, transport, handle, and employ the Hornet under realistic conditions;
- the Army did not revalidate the rationale for the continued development of the WAM as the related threat had significantly reduced since the end of the Cold War;
- the program manager did not properly develop and update the test and evaluation master plan and the acquisition strategy; and
- the program manager did not recommend that the Defense Acquisition Executive oversee the WAM program as required.

Those conditions occurred because the Army and the program office did not adhere to DoD and Army policies and procedures for effectively managing major systems and programs. As a result, the Army has obligated about \$305 million in research, development, test and evaluation funds, for a weapon system that, after 12 years of development effort, had yet to demonstrate, through developmental testing or a dedicated phase of operational test and evaluation, the ability to satisfy minimum acceptable operational performance requirements. Further, if the program continues, the Army plans to obligate another \$30.7 million to complete development efforts and \$237.6 million in procurement funds through FY 2007. Of the \$237.6 million, the program manager plans to spend \$23.2 million to procure 107 Hornets in excess of the 270 Hornets required by the 82nd Airborne Division.

Acquisition and Materiel Release Policy

DoD Policy. DoD Instruction 5000.2, “Operation of the Defense Acquisition System,” October 23, 2000, and DoD Regulation 5000.2-R, “Mandatory Procedures for Major Defense Acquisition (MDAPs) and Major Automated Information System (MAIS) Acquisition Programs,” June 10, 2001, establish policies and procedures for managing major acquisition programs. The DoD 5000 series documents:

- require the conduct of operational test and evaluation to determine the operational effectiveness and suitability of a system under realistic operational conditions and to determine whether the minimum acceptable operational performance requirements as specified in the requirements document have been satisfied;
- require the program manager to develop and document an acquisition strategy that will serve as the road map for program execution from program initiation through post-production support and include the critical events that govern the management of the program;
- require the program manager to obtain cost performance reports on all contracts that require compliance with earned value management system guidelines. Cost performance reports provide contract cost and schedule performance for program management, provide early indications of contract cost and schedule problems, and permit assessment of implemented management actions to resolve such problems;
- require milestone decision authorities to use exit criteria as one of the tools available to decide whether an acquisition program should progress within an acquisition phase or continue to the next phase at milestone decision points; and
- define program acquisition categories and the corresponding milestone decision authorities for program oversight.

Army Acquisition Policy. Army Regulation 70-1, “Research, Development, and Acquisition, Army Acquisition Policy,” January 15, 1998, requires the Army to follow the guidance and procedures contained in DoD Regulation 5000.2-R for Acquisition Category II major systems.

Army Materiel Release Policy. Army Regulation 700-142, “Materiel Release, Fielding, and Transfer,” May 1, 1995, establishes the documentation requirements for releasing and fielding materiel within the Army.

Status of WAM Program

As provided in DoD Instruction 5000.2, the outcome of systems acquisition is a system that represents a judicious balance of cost, schedule, and performance in response to an expressed need. The Army, however, allowed costs to increase, schedules to slip, and performance to degrade.

Original Cost and Schedule. On February 6, 1990, the Assistant Deputy Chief of Staff for Operations and Plans, Force Development approved the ROC for the WAM. The ROC projected an initial operational capability for the Hornet by the 4th Quarter of FY 1995. As of June 2001, the Hornet had not reached its initial operational capability; this represents a schedule slip of more than 5 years since the program inception. Moreover, the ROC projected the purchase of 15,416 units at a cost of \$11,110 per unit.

Revised Cost and Schedule. With the objective to enhance program stability and control cost growth, the WAM milestone decision authority approved an acquisition program baseline agreement on June 18, 1996. The agreement showed that the first Army unit would be equipped with the Hornet by September 1999. The agreement also showed a total procurement of 33,991 units at a threshold cost of \$38,100 each. As of June 2001, the program office had yet to field an operational unit, and had reported a FY 2000 unit cost of \$217,014 each, a unit cost increase of 1,550 percent more than the original projected cost of \$11,110 in 1990 that was inflated to \$13,145 in FY 2000 dollars.² In subsequent production years, the estimated unit cost declines to \$56,826, a 330 percent increase more than the original unit cost projection (as inflated to FY 2000 constant dollars).

Revised Mission Scenarios. Although the Army could not explain the reason for the increased WAM quantities, we noted that the Army revised its mission scenarios for the WAM because of the operational performance deficiencies identified during testing. In the 1990 ROC, the operational concept was to deploy twenty Hornets to overwatch conventional minefields. Because of identified performance deficiencies, the Army changed mission scenarios and used the Hornet in the gauntlet and X-pattern from overwatching conventional minefields. The gauntlet obstacle consisted of using up to nine clusters (with three to six Hornets per cluster), while the X-pattern obstacle consisted of 20 Hornets (in five clusters of four Hornets each). Also, in greater than 4 inches of snow, the Army plans to use nearly twice as many Hornets in each of the above scenarios.

Challenges of the Advanced Hornet. The WAM program continues to face challenges in the areas of cost, schedule, and performance as related to the Advanced Hornet. However, those challenges have become increasingly difficult to quantify. The program status report of the Defense Contract Management Agency to the program manager for the period February 16 through March 16, 2001, shows both cost and schedule as high risk. It further

²The Director, Strategic and Tactical Systems, Under Secretary of Defense for Acquisition, Technology, and Logistics, provided an adjusted unit cost of \$13,145 inflated to FY 2000 dollars.

states that the program significantly deviated from the cost and performance of the work budgeted. However, at the direction of the program office, the contractor reported only actual costs and not the budget information needed to measure the performance of the contractor. In the cost performance reports for the financial periods ending May 28, 2000 through April 29, 2001, the contractor for the Advanced Hornet reports only actual and cumulative costs at the direction of the program office. The contractor indicated that budget information would not be reported until the WAM Program Office completed a restructure of the WAM program, scheduled for completion in September 2001. In the cost performance report for the financial period ending April 29, 2001, the contractor further states that the program manager was continuing to refine the requirements for the Advanced Hornet.

DoD Regulation 5000.2-R requires program managers to obtain cost performance reports to provide early indications of contract cost and schedule problems and to permit an assessment of implemented management actions to resolve such problems. Without reporting budget information, the program manager cannot determine whether the contractor cost and schedule performance was under or over budget cost and schedule requirements.

Additionally, DoD Regulation 5000.2-R requires milestone decision authorities to use exit criteria as one of the tools available for use in deciding whether an acquisition program should progress within an acquisition phase or continue to the next phase at milestone decision points. Exit criteria are program-specific accomplishments that must be satisfactorily demonstrated before a program can progress further in the current acquisition phase or continue to the next acquisition phase. As discussed in Inspector General, DoD, Report No. D-2001-032, "Use of Exit Criteria for Major Defense Systems," January 10, 2001, the WAM program does not have exit criteria for the next Advanced Hornet milestone decision because of ongoing efforts to restructure the program.

As shown in Appendix C, the WAM program has a history of changes in performance requirements and threats, and test results that indicated that the Hornet was not operationally effective. Notwithstanding this information, the Army continued to support the funding and development of that program.

Requirements and Demonstrated Capabilities

On June 18, 1996, the Program Executive Officer, Armored Systems Modernization (then the milestone decision authority), approved the Hornet for low-rate initial production and authorized the continued development of the Advanced Hornet. The Program Executive Officer granted approval even though the weapon system did not demonstrate, through developmental testing or through a dedicated operational test and evaluation, its capabilities to satisfy minimal acceptable operational performance requirements.

Requirements. The ROC established 15 operational performance requirements for the Hornet, and an additional operational performance requirement for the Advanced Hornet. The WAM Acquisition Plan, approved by the milestone

decision authority on June 9, 1995, and updated June 17, 1996, states that the Hornet and the Advanced Hornet must conform to the operational performance requirements established in the ROC.

Requirements Changes. Since the approval of the ROC in 1990, the Army Engineer School, as the user representative for the Army, allowed the WAM Program Manager to deviate from the original ROC operational performance requirements. Specifically, the Army Engineer School, at the request of the WAM Program Manager, approved changes of operational performance requirements to a level below that acceptable by the user.

For example, the ROC requires that the Hornet perform with a 70 percent success rate and operate in limited visibility conditions such as rain and snow and (based on a European environment) on slopes of 15 degrees or less. On July 22, 1991, the Director of Combat Developments, Army Engineer School, agreed with the WAM Program Manager to allow WAM operational performance degradations for extreme weather conditions that the Army estimated to occur 20 percent of the time.³ Accordingly, the 70 percent success rate for the WAM would apply only 80 percent of the time and result in a 58 percent expected performance rate. (Appendix D provides more detail on the calculations for the expected overall performance rate.) At the WAM Program Manager's request, the Director of Combat Developments also allowed the performance of the WAM to degrade to 50 percent when the WAM was required to engage a target in rain, more than 4 inches of snow, or on slopes beyond 6 degrees. Because the emplacing units deploy the munition in advance of target engagement, it is unlikely that the units would know the environmental conditions that will exist when the target is engaged. The Army Engineer School had not updated the ROC to show a revised WAM expected performance success rate.

As discussed subsequently in the materiel release section of the finding, the need for the WAM to engage wheeled vehicles as targets is essential to Army users; however, on May 17, 1996, the Director of Requirements, Office of the Deputy Chief of Staff for Operations and Plans, approved another change to the ROC that omitted heavy wheeled vehicles as valid targets for the Hornet. Further, in April 2001, the Army Training and Doctrine Command System Manager, Engineer Combat System (the user representative), agreed to a program office request to allow the contractor to substitute radios that are not as common as the original radio proposed for the communication requirement of the Advanced Hornet. The system manager allowed the change because the program office determined that cost and schedule constraints could not be met if it continued with the current design approach. The prime contractor plans to modify its subcontract to procure an unspecified quantity of radio systems other than the Single Channel Ground and Airborne Radio System.

The prime contractor's system specifications for the Advanced Hornet, November 1998, specified that the WAM would interface with the Single Channel Ground and Airborne Radio System. This system is a very high-

³The Army Armament Research, Development and Engineering Center used a Search and Destroy Munition weather sensitivity study to determine severe and extreme weather conditions.

frequency, frequency modulation combat net radio developed by the Army. It is the primary means of command and control for infantry, armor, and artillery units. By allowing the contractor for the Advanced Hornet to use a radio other than the Single Channel Ground and Airborne Radio System, the Army Engineer School introduced additional training, supply, and maintenance issues into Army units receiving the Advanced Hornet.

Demonstrated Capabilities. On July 16, 1999, the Director, Operational Test and Evaluation, issued his report, “Live Fire Test and Evaluation of the XM-93 Hand-Emplaced Wide Area Munition (HE-WAM).” The purpose of the report was to assess the lethality of the Hornet.

Also, in April 2000, the Army Test and Evaluation Command (ATEC), the Army independent testing organization, issued the “System Evaluation Report For Materiel Release of the Hand Emplaced – Wide Area Munition (HE-WAM).” This report assesses the performance of the Hornet against the 15 operational performance requirements established in the ROC. The Army Engineer School designated 5 of the 15 operational performance requirements as specific critical functional objectives in the ROC. In May 1999 and July 2000, ATEC also provided the WAM Program Manager with safety confirmations on the ability of the Army users to safely store, transport, handle, and employ the Hornet. Moreover, on March 12, 2001, the Deputy Under Secretary of the Army (Operations Research) concurred with ATEC that sufficient testing had been completed to deem the WAM safe to employ.

Live-Fire Test and Evaluation. ATEC performed the live-fire test and evaluation of the Hornet under the oversight of the Office of the Director, Operational Test and Evaluation, to assess its lethality. The Director, Operational Test and Evaluation, concluded that the live-fire test of the Hornet against actual threat vehicles demonstrated its lethality, given a hit against tanks and light armored vehicles when critical areas were struck. The Director, Operational Test and Evaluation, also concluded that the Hornet was not effective out to its required range and was only marginally effective at half the required range. Commenting on the conduct of the live-fire test and evaluation of the Hornet, the Director, Operational Test and Evaluation, stated that:

- insufficient test data were gathered to assess all aspects of operational effectiveness and suitability; that is, no realistic operational testing of the tactical Hornet, including firing at moving threat targets, was conducted;
- few end-to-end firings were conducted of the tactical Hornet, and those were all against single tank targets, traveling on flat ground, and on a straight path whose closest point of approach was exactly 50 meters;
- no tactical Hornet shots were made against targets out to the required 100-meter engagement range; and
- tactical firings were not made against non-tank targets.

Operational Test and Evaluation. Based on all testing performed (developmental and operational), ATEC concluded, in its April 2000 System Evaluation Report, that the Hornet was not operationally effective because the Hornet did not satisfy all of its effectiveness requirements, foremost being the probability of kill requirement. Conversely, ATEC concluded that the Hornet was operationally suitable because changes in design, as well as changes in tactics, techniques and procedures, addressed previously identified suitability issues.

The ATEC System Evaluation Report showed that the Hornet met 5 of the 15 performance requirements. The remaining 10 performance requirements were either partially met (6), not met (2), or not tested (2). Moreover, ATEC stated that the Hornet did not achieve one of the five specific critical functional objectives; that is, a self-destruct just before the end of the battery's life. The performance requirement for the Hornet to self-destruct before battery life expenditure is needed so that enemy forces cannot secure the Hornet and its technology. The report also concluded that the Hornet partially met only three of the remaining four specific critical functional objectives.

In conducting the test, ATEC did not use either production or production-representative items and did not ensure that testing was accomplished under realistic conditions. As a result, ATEC reached conclusions on operational effectiveness and operational suitability that were based on incomplete and nonrepresentative test data. Appendix E provides more detail on the Hornet performance against each of the 15 operational performance requirements.

Use of Live Munitions. Instead of using live munitions to conduct Hornet operational tests, ATEC used inert trainers that were the same configuration as the live munition with respect to size, weight, and appearance but did not contain high explosives. ATEC noted in its test report that the use of inert trainers detracted from the realism of the test because the soldiers knew they were using the inert trainers, and that removed the stress connected with working with live munitions. As a result, the test data showed that the soldiers sometimes held the manually armed inert trainers for as much as 6 minutes before emplacement. As designed, the safe separation time allotted for manual arming is 5 to 6 minutes. When asked why live munitions were not used, the Technical Director for ATEC stated that operational testing was never performed using live munitions. However, Army policy on test and evaluation requires the operational test environment to be as realistic as possible and for typical users to operate and maintain the system under actual deployment conditions.

Reported Test Limitations. In the System Evaluation Report, ATEC states that it did not conduct the operational test of the Hornet under realistic conditions. Specifically, the Hornets used during operational tests were not production or production-representative because they were not live tactical munitions. Instead, ATEC used inert trainers as discussed above. Although technical tests used live munitions, the Hornets were not armed by soldiers, but were armed using a remote arming fixture.

Other test limitations included terrain restrictions, lack of battlefield noise, and the use of modeling and simulation. For safety reasons, ATEC prohibited testers from crossing hard-surface roads on foot and in mission-oriented protective posture level IV gear. This prohibition was a significant test restriction because the Army planned to use a gauntlet configuration on high-speed avenues of approach for emplacement of the Hornet, which includes hard-surface roads. Also, ATEC did not evaluate the effects of battlefield noise on the Hornet, even though the Hornet uses acoustic and seismic sensors to detect targets. Technical testing attempted to evaluate battlefield noise by using recorded background noises played through speakers. However, test range limitations resulted in unclear results that ATEC could not readily interpret. Without knowing the impacts of battlefield noise on Hornet performance, the Army has no assurance that the Hornet can operate in the presence of acoustic and seismic stimuli expected in a battlefield environment. Finally, the modeling and simulation did not include the effects of smoke and other obscurants on the deployed Hornet in an operational environment. As a result, the modeling and simulation did not provide results that realistically represent expected Hornet operational performance on the battlefield.

Testing for Safety. As stated in an ATEC safety confirmation memorandum, May 27, 1999, ATEC evaluated Hornet safety by testing a variety of attributes and selected a specific quantity of Hornets to test for each attribute. For example, ATEC performed and evaluated a series of tests that involved dropping a Hornet 7 feet onto a steel plate. They dropped 2 units without a shipping container; 3 units with a shipping container, at ambient temperature; and 9 units with a shipping container, conditioned at a temperature of 145 degrees Fahrenheit, and 17 units with a shipping container, conditioned at a temperature of -60 degrees Fahrenheit. Although the tested Hornet units passed each of the above tests, it is unclear how ATEC applied those test results to reach the conclusion that the Hornet was safe to store, transport, handle, and employ. We asked ATEC, the Army's independent test organization, to provide information such as the criteria used to design the sampling plan and the lot size for reaching conclusions on WAM safety. ATEC referred our questions to the program office. However, the program office response did not provide sufficient information to allow us to confirm the conclusion by ATEC that the Hornet was safe. Specifically, the program office did not provide the sampling rationale used and the 90 percent acceptable defect rate provided by the program office did not appear realistic.

Even without knowing the acceptable error rates or sampling rationale, it is possible, based on sound statistical acceptance sampling, to project the accuracy of a conclusion on WAM safety that is based on sample sizes. To illustrate, based on a sample of two Hornets passing a 7-foot drop onto steel plate without a shipping container, ATEC assumed that all WAM units would pass this test. If ATEC accepts a 1 percent failure rate for the universe, and bases its conclusion on testing two units, there is a 98 percent chance for an incorrect conclusion that an error rate of 1 percent or less actually exists for the entire universe. Conversely, if ATEC accepts a 10 percent failure rate, and bases its conclusion on testing two units, there is an 81 percent chance for an incorrect conclusion that an error rate of 10 percent or less actually exists for the entire universe.

Based in part on the operational test and evaluation performed, ATEC issued safety confirmation memorandums on May 27, 1999, and July 19, 2000. The memorandums conclude that the Hornet was safe to store, transport, handle, and employ. As discussed, the conclusion was not based on a statistically adequate sample. Therefore, no statistically valid conclusion on the safety of the Hornet can be made based on the data available.

Oversight. DoD Directive 5141.2, “Director of Operational Test and Evaluation (DOT&E),” May 25, 2000, provides for the oversight of operational test and evaluation of major Defense acquisition programs and selected programs by the Director, Operational Test and Evaluation. The Director, Operational Test and Evaluation did not oversee the operational test and evaluation of the Hornet because the WAM program did not qualify for operational test oversight as it was less than the funding threshold for an Acquisition Category I program. However, as a result of concerns expressed to the Office of the Director, Operational Test and Evaluation on December 15, 2000, regarding the quality of operational test and evaluation performed on the Hornet, the Director, Operational Test and Evaluation, decided to place the Advanced Hornet on the oversight list for operational test and evaluation.

Conclusion. Based on established operational performance requirements and capabilities demonstrated through testing:

- the Army did not demonstrate the operational performance requirements of the Hornet that were originally established and accepted by the user;
- the Hornet met only 5 of the 15 operational performance requirements established by the user before low-rate initial production and deployment;
- the program manager did not require the conduct of a dedicated test and evaluation using realistic conditions, such as effects of battlefield noise, even though the Hornet uses acoustic and seismic sensors to detect targets; and
- the Army independent test organization did not perform necessary tests to prove that typical Army users could safely store, transport, handle, and employ the Hornet.

Additionally, for assurances of safety, the operational user relies on ATEC conclusions that are judgmental, rather than based on an adequate statistical sample size.

Change in Threat

The Army did not revalidate the rationale for the continued development and the approved acquisition objective for the WAM as the threat that justified the need for the WAM decreased significantly. The Army initiated the WAM program to increase the complexity of minefields and the time required for an enemy to

breach the minefield. The Army approved the ROC on February 6, 1990, and revised it on May 17, 1996. The 1990 ROC stated that Soviet and Warsaw Pact forces would remain the most serious threat to the Army beyond 2015.

Subsequent documentation, however, recognized the impact of the dissolution of the Soviet Union. Specifically, the “Wide Area Mine Cost and Operational Effectiveness Analysis Main Report,” July 1992, which the Army Engineer School approved, states that the primary projected threat for the WAM had been greatly overcome by events. Moreover, the “Wide Area Munition Advanced Hornet System Threat Assessment Report,” October 2000, states that, before 1990, the threat environment of concern was a war against combined Russian and Warsaw Pact forces in Central Europe. Additionally, the number of targets that the WAM was designed to engage, significantly decreased since 1990.

The ROC identified the targets for the WAM as armored and heavy wheeled vehicles. A comparison of the armored targets in the 1990 Antiarmor Master Plan with those in the January 2000 Defense Intelligence Agency Outyear Threat Report showed that the number of armored targets that U.S. Forces expect to face from 2002 through 2007 will drop significantly. Specifically, the number of enemy tanks and armored combat vehicles in the Outyear Threat Report had reduced by more than 80 percent from the number of targets in the 1990 Antiarmor Master Plan. As a result, the Hornet may no longer be required to meet a threat that existed more than 12 years ago.

The General Accounting Office reached a similar conclusion in its report, “Defense Acquisitions: Reduced Threat Not Reflected in Antiarmor Weapon Acquisitions,” July 1999. The General Accounting Office concludes that the threat of a massive, heavily armored attack by potential enemies had greatly diminished, and that the DoD plans to acquire large quantities of new and improved antiarmor weapons did not appear consistent with the reduced size of the armored threat. In a subsequent report, “Defense Acquisitions: Higher Level DoD Review of Antiarmor Mission and Munitions Is Needed,” June 2001, the General Accounting Office states that the DoD has a large inventory of about 40 different types of antiarmor weapons and is currently funding 13 new antiarmor weapons, including the WAM, to defeat the diminished threat. Accordingly, the continued development of the WAM and the quantities of WAMs required to defeat the reduced armored combat vehicle threat needs revalidation.

Program Documentation

The Army did not properly develop and update program documentation needed to manage the WAM program and make informed decisions effectively. Program documents such as the test and evaluation master plan, the acquisition strategy, and the get-well plan for the conditional materiel release of the Hornet did not meet regulatory requirements and contain current programmatic decisions. As a result, the Army has no assurance that it is making programmatic decisions based on the most current information available.

Test and Evaluation Master Plan. The test and evaluation master plan (master plan) documents the overall structure and objective of the test and evaluation program. DoD Regulation 5000.2-R requires that master plans include conducting a dedicated, independent operational test and evaluation, using production or production-representative articles and typical users, before a decision is made to enter full-rate production. The purpose of such testing is to determine system operational effectiveness and suitability under realistic (combat) conditions and to determine whether the minimum acceptable operational performance requirements have been satisfied.

The master plan for the WAM did not include a requirement for conducting a dedicated operational test and evaluation of production or production-representative Hornet units under realistic (combat) conditions. The WAM master plan, which the program manager and ATEC developed, was approved by representatives from test organizations throughout the Army. Without plans to conduct a dedicated operational test and evaluation before fielding the Hornet, ATEC limited its ability to make valid conclusions concerning the Hornet's operational effectiveness, operational suitability, and weapon system safety because of incomplete and nonrepresentative test data.

Acquisition Strategy. The program manager did not update the WAM acquisition strategy as needed to ensure that it satisfied Army fielding requirements. This condition occurred because the program manager did not ensure that the acquisition strategy showed the current Army acquisition objective approved in recent programmatic decisions for the WAM. As a result, the acquisition strategy of the program manager did not agree with the approved Army acquisition objective in budget documentation. Further, the program manager planned to acquire 107 Hornet units in excess of the 270 required by the 82nd Airborne Division, the only unit scheduled to receive the Hornet.

Approved Acquisition Objective. On March 29, 1995, the milestone decision authority for the WAM program approved the acquisition strategy submitted by the program manager. The acquisition strategy showed a WAM program acquisition objective of 33,799 units. On June 17, 1996, the milestone decision authority approved a revised acquisition strategy that included a WAM program acquisition objective of 33,991 units. The program office, however, did not have documentation from the Army to support the computation of either of those program acquisition objectives.

Although the number of armored targets has decreased by 80 percent since 1990, the Army has increased the number of WAMs required to neutralize the threat. Since 1998, the Deputy Chief of Staff for Operations provided the U.S. Congress with a Budget Estimate Submission showing an approved Army acquisition objective of at least 53,376 WAM units. The Deputy Chief of Staff for Operations based the Army's approved acquisition objective on a study that the Center for Army Analysis performed. The Center for Army Analysis did not use the latest threat analysis in its computation. Instead, it used doctrinal information, engineer capabilities, and combat simulations.

Hornet Quantities Required. The WAM Program Office plans to procure 377 Hornets to satisfy Hornet requirements of the 82nd Airborne

Division. The Army designated fielding of the 377 Hornets for the 82nd Airborne Division, which was the only Army unit scheduled to receive the Hornets, despite the Hornet deficiencies identified in the conditional materiel release. However, the 82nd Airborne Division needs only 270 Hornets to fulfill the WAM requirement. Because the October 2000 Budget Estimate Submission shows a Hornet unit cost for FY 2000 of \$217,014, the program office is planning to spend \$23.2 million to procure 107 Hornets in excess of the 270 Hornets that the 82nd Airborne Division needs.

Materiel Release. Army Regulation 700-142 allows for the conditional materiel release of a weapon system when one or more of the criteria for full materiel release have not been met. Army Regulation 700-142 also requires a get-well plan for each weapon system performance criterion that precluded the full materiel release. The get-well plan must include the projected date for correcting each weapon system performance deficiency as well as the means of correction. The WAM Program Manager did not adhere to Army Regulation 700-142 requirements on the conditional materiel release of the Hornet to the 82nd Airborne Division. Specifically, the program manager did not establish a get-well plan that addressed all of the weapon system deficiencies associated with the Hornet and did not identify how or when the deficiencies would be resolved.

Get-Well Plan for the Hornet. In December 2000, the WAM Program Manager requested a conditional materiel release for the Hornet because design limitations, as identified through developmental and operational tests, showed that the Hornet did not meet ROC performance requirements. Although the conditional materiel release request included the requisite get-well plan, the plan did not identify all ROC weapon system performance deficiencies associated with the Hornet and did not address the associated corrective action(s). Specifically, the get-well plan did not identify the inability of the Hornet to satisfy its self-destruct requirement and the ability of the Hornet to only partially satisfy the requirements for arming reliability in both the manual and remote arming modes.

In the get-well plan, the WAM Program Manager indicated a get-well date of March 31, 2004, that corresponds to the scheduled full materiel release of the Advanced Hornet. The WAM Program Manager stated that the Hornet would not be retrofitted to correct the weapon system deficiencies that caused the conditional materiel release.

Although the 82nd Airborne Division was aware of WAM operational performance shortfalls and the allowable environmental degradations, the 82nd Airborne Division was not aware that the Hornet, as designed, could not attack wheeled vehicles. In October 2000, the program office briefed the 82nd Airborne Division that the Advanced Hornet would improve performance against wheeled vehicles. That statement implied that the Hornet had some level of operational performance against wheeled vehicles, which it does not. In a meeting with us on April 3, 2001, the 82nd Airborne Division stated that the WAM performance requirement against wheeled vehicles was mission essential. Without that capability, the 82nd Airborne Division stated it would rather use weapon systems that were already in the Army's warfighting inventory and were

capable of functioning against wheeled vehicles. Those weapon systems included: the M21 anti-tank mine, the Javelin, and the Tube-Launched Optically tracked Wire-guided missile.

Potential Impact of Uncorrected Deficiencies. The Army Audit Agency discussed potential problems associated with ineffective or unimplemented get-well plans in Army Audit Agency Report AA 99-411, "Materiel Release," September 30, 1999. The Army Audit Agency Report AA 99-411 cites examples of uncorrected weapon system deficiencies that resulted in loss of life, a failure to meet critical performance requirements, and increased costs. For example, the Apache helicopter program had six open deficiencies since 1986 that were associated with a conditional materiel release. In FY 1994, an in-flight failure involving one of the open deficiencies resulted in the loss of two lives and the total destruction of an Apache helicopter at a cost of \$11 million.

In another example, the Army fielded the Kiowa Warrior helicopter under a conditional materiel release in FY 1992. In FY 1995, the deficiencies, affecting helicopter weight, caused two major accidents that resulted in damages of almost \$1 million. The Army determined that the excess weight of the aircraft affected landing, causing engine failure as the aircraft rapidly descended. As a result of the safety problem, the Army developed a two-phase Safety Enhancement Program to reduce the risk to Kiowa Warrior helicopter aviators. The enhancements will cost about \$326 million and will not be completed until FY 2006. The Office of the Deputy Chief of Staff for Logistics agreed to the intent of the Army Audit Agency recommendation to prioritize deficiencies and establish a maximum time frame of 3 years to resolve the deficiencies determined to be high priority.

The Army based its decisions concerning the conditional materiel release of the Hornet on incomplete documentation. As previously discussed, the Hornet get-well plan did not provide a comprehensive list of all operational performance shortcomings as required. As a result, the Assistant Deputy Chief of Staff for Logistics, Army Forces Command, assumed that the Hornet met all ROC operational performance requirements not listed, to include pursuit of wheeled vehicles. The granting of the conditional materiel release for the Hornet required Army command statements and approvals in addition to the get-well plan. Army Regulation 700-142 requires that the gaining major command complete an Urgency of Need Statement for conditional materiel release of all Army weapon systems. The Urgency of Need Statement documents the gaining major command's acceptance of the conditions of release as documented in the get-well plan.

On February 13, 2001, the Assistant Deputy Chief of Staff for Logistics signed the Urgency of Need Statement for the conditional materiel release of the Hornet to the 82nd Airborne Division based on the deficiencies listed in the get-well plan. Based on the Urgency of Need Statement provided by the Assistant Deputy Chief of Staff for Logistics, Army Forces Command, the Commander, Army Tank-automotive and Armaments Command approved the conditional materiel release of the Hornet to the 82nd Airborne Division on March 16, 2001.

Acquisition Category

The WAM Program Manager did not recommend to the milestone decision authority that the oversight of the WAM program be raised to the level of an Acquisition Category I program. The condition occurred in part because of a concern that the WAM program would not be able to withstand the increased oversight associated with an Acquisition Category I program. As a result, the Defense Acquisition Executive was not given the opportunity to provide the level of oversight required for a program that may be valued at more than \$3 billion.

DoD Instruction 5000.2 defines an acquisition category as an attribute of an acquisition program that determines the program level of review, decision authority, and applicable procedures. Acquisition Category I programs include two subcategories: Acquisition Category ID programs where the milestone decision authority is the Under Secretary of Defense for Acquisition, Technology and Logistics, and Acquisition Category IC programs where the milestone decision authority is the Component Acquisition Executive.

Additionally, DoD Instruction 5000.2 requires DoD Components to classify programs for which estimated expenditures for research, development, test and evaluation or for which procurement totals more than \$365 million and \$2.19 billion, respectively, as Acquisition Category I major programs. Those programs are classified with either the Defense Acquisition Executive or the Component Acquisition Executive, if delegated, as the milestone decision authority. Usually, the Defense Acquisition Executive makes either the low-rate initial production decision or the full-rate production decision for Acquisition Category I major Defense acquisition programs.

On December 18, 1998, the Army Training and Doctrine Command System Manager, Engineer Combat System (the user representative) sent an electronic message to the WAM Program Manager, subject "Hornet Product Improvement Program (PIP)." The purpose of the message was to present the user position on the program manager's proposed change to the execution of the WAM program. In the message, the system manager emphasized the requirement for the program to remain under the Acquisition Category I threshold because "Simply put, we can't hold up to the scrutiny that we will incur should we become an ACAT I [acquisition category I] program...."

The Army managed the WAM program as an Acquisition Category II major system. Based on the approved Army acquisition objective, the program meets the requirement for designation as an Acquisition Category I major Defense acquisition program. Since the Army established the WAM, the estimated program costs have grown. In the October 2000 Budget Estimate Submission, the Army reported an approved acquisition objective of 53,376 WAMs. If the Army procures the total acquisition objective of 53,376 units, based on the FY 2007 estimated WAM unit cost of \$56,826, WAM procurement program costs would total about \$3.06 billion. Based on the acquisition objective quantities, the program meets the procurement cost criteria for classification as an Acquisition Category I major Defense program.

Summary

We recognize that the warfighters support the concept for the WAM development. However, the WAM is a weapon system that has been in development for 12 years, has experienced a unit cost increase of 330 percent and a schedule slippage of more than 5 years, has not demonstrated the ability to meet minimum operational performance requirements that are acceptable to the user, and may no longer be needed to defeat the reduced threat since the end of the Cold War. Accordingly, the cost increases, combined with the lack of a clear return on investment to the operational user, and the significant reduction in threat, raises serious questions as to the cost-effectiveness of the WAM.

Because of the continuing development problems with the WAM program, the Under Secretary of Defense for Acquisition, Technology and Logistics should conduct a special review of the WAM program to determine whether the current program should continue.

Potential Funds Put to Better Use. Through FY 2001, the Army obligated \$305 million for research, development, test and evaluation. It plans to obligate an additional \$30.7 million to complete development efforts through FY 2003, and \$237.6 million for production through FY 2007 for a total of \$268.3 million.⁴ If the Under Secretary of Defense for Acquisition, Technology, and Logistics makes the decision to discontinue the production of the Hornet and the development of the Advanced Hornet, the Army could put the remaining funding of \$30.7 million for research, development, test and evaluation and \$237.6 million for procurement in the Future Years Defense Plan to better use.

Management Comments on the Finding and Audit Response

Summaries of management comments on the finding and audit response are in Appendix F.

⁴The WAM Program Manager planned an additional \$18.844 million of research, development, test and evaluation funding for WAM in FY 2002 and \$11.872 million in FY 2003. In addition, the program manager planned the following production funding: \$2.013 million in FY 2002, \$27.571 million in FY 2003, \$38.334 million in FY 2004, \$55.010 million in FY 2005, \$57.249 million in FY 2006, and \$57.394 million in FY 2007.

Recommendations, Management Comments and Audit Response

1. We recommend that the Under Secretary of Defense for Acquisition, Technology, and Logistics conduct a special review of the Wide Area Munition program and determine whether the current program should continue by obtaining and assessing:

a. data on program cost and schedule growth since program inception;

b. Advanced Hornet contract cost performance reports to determine the extent of program cost and schedule risks and the potential for further program cost increases and schedule slippage;

c. documentation that justified changes to the minimum operational requirements of the Hornet and Advanced Hornet;

d. live-fire and operational test reports to determine whether the program office and contractor have viable plans to correct performance deficiencies identified during testing that affected the successful demonstration of 10 of the 15 operational performance requirements;

e. the propriety of test documentation that supported the Hornet safety confirmation used to reach conclusions concerning the safety of the Hornet;

f. a current threat analysis to determine the continued need for the Wide Area Munition in view of the reduced threat and other antiarmor systems available to defeat the same threat;

g. the need for a dedicated operational test and evaluation, in the test and evaluation master plan, to ensure that the Wide Area Munition is tested under realistic conditions, to include operation by typical users with live munitions, and battlefield noise;

h. the justification for Wide Area Munition procurement quantities addressed in the program acquisition strategy;

i. the completeness of documentation that supported Army decisions concerning the Hornet conditional materiel release and the get-well plan; and

j. the Army's rationale for not recommending that the program be managed as an Acquisition Category I program as required.

Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics Comments. The Director, Strategic and Tactical Systems, concurred that a review of the Wide Area Munition program was warranted. Instead of

the Under Secretary of Defense for Acquisition, Technology, and Logistics conducting the review as recommended, the Director, Strategic and Tactical Systems stated that he would assign the Deputy for Munitions to lead a review team, that will include the Offices of the Director for Program Analysis and Evaluation, the Director, Operational Test and Evaluation, and the Army Deputy Chief of Staff for Operations and Plans. The Director, Strategic and Tactical Systems stated that the review would focus on confirming the requirement for the Wide Area Munition, determining the appropriate acquisition category for the program, and assessing the viability of the Army plans for ensuring that the Advanced Hornet meets operational performance requirements.

Audit Response. The Director, Strategic and Tactical Systems, comments were partially responsive to the recommendation. A review of the Wide Area Munition program led by the Deputy for Munitions is an acceptable alternative to the Under Secretary of Defense for Acquisition, Technology, and Logistics performing the review as recommended. However, the review of the Wide Area Munition program should also assess:

- the propriety of test documentation that supported the Hornet safety confirmation used to reach conclusions concerning the safety of the Hornet;
- a current threat analysis to determine the continued need for the Wide Area Munition in view of the reduced threat and other antiarmor systems available to defeat the same threat; and
- the completeness of documentation that supported Army decisions on the Hornet conditional materiel release and get-well plan.

In Appendix F, we discuss why those areas should also be made part of the review of the Wide Area Munition program. Accordingly, we request that the Director, Strategic and Tactical Systems, reconsider the extent of the planned review when responding to the recommendation in the final report.

2. We recommend that the program manager for the Wide Area Munition immediately validate Hornet requirements for the 82nd Airborne Division and adjust procurement quantities.

Army Comments. The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology), responding for the WAM Program Manager, stated that the Training and Doctrine Command Systems Manager revalidated the need for 377 Wide Area Munitions. The Acting Assistant Secretary disagreed with the finding and stated that the 270 basic Wide Area Munitions represented the basic load for the combat engineer battalion. A basic load is the amount of ammunition a unit needs for one engagement and usually represents an initial capability for the unit's requirement for a campaign but does not represent the unit's total requirement. The Acting Assistant Secretary stated that the 82nd Airborne Division accepted the conditional materiel release of the basic Wide

Area Munition in January 2001, and further stated that the program manager received a July 9, 2001, letter from Headquarters, U.S. Army Forces Command, reiterating the Army's urgent need for the Hornet.

Audit Response. The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) comments were not fully responsive. We stand by our finding statements. We agree that the 270 basic Wide Area Munitions represented the basic load for the 82nd Airborne Division. However, as indicated in the finding, the 82nd Airborne Division stated that it was not aware when it accepted the conditional release of the basic Wide Area Munition that the basic Wide Area Munition, as designed, could not attack wheeled vehicles. The 82nd Airborne Division stated that the Wide Area Munition performance requirement against wheeled vehicles was mission essential. Without that capability, the 82nd Airborne Division stated it would rather use weapon systems that were already in the Army's warfighting inventory that were capable of functioning against wheeled vehicles. Under those circumstances, it would be fiscally prudent for the Army to limit its investment in the basic Wide Area Munition to the 270 units needed to fulfill the 82nd Airborne Division basic load, and not procure the remainder of the 82nd Airborne Division Wide Area Munition requirement until the contractor can produce units that are capable of attacking wheeled vehicles. Accordingly, we request that the Army reconsider its position when responding to the recommendation in the final report.

Appendix A. Audit Process

Scope

We reviewed documentation dated from November 1986 through June 2001. We used criteria in DoD Instruction 5000.2, "Operation of the Defense Acquisition System," October 23, 2000, and DoD Regulation 5000.2-R "Mandatory Procedures for Major Defense Acquisition Programs (MDAPs) and Major Automated Information System (MAIS) Acquisition Program," June 10, 2001, to perform the audit.

To accomplish the audit objective, we took the following steps:

- determined whether the users adequately defined the system requirements;
- determined whether the program office developed and implemented an acquisition strategy, an acquisition plan, a risk management plan, and a test and evaluation plan;
- compared the armored targets in the 1990 Antiarmor Master Plan with those in the 2002-2007 Defense Intelligence Agency Outyear Threat Report;
- examined the Hornet engineering, manufacturing, and development contract DAAA21-90-C-0018, low-rate initial production contract DAAE30-96-C-0015, and the engineering, manufacturing, and development contract for the Advanced Hornet. We discussed the content of the contracts with the Defense Contract Management Agency;
- reviewed the Hornet get-well plan to determine whether it supported the material release of the Hornet to the 82nd Airborne Division; and
- reviewed management controls related to the audit objective.

General Accounting Office High-Risk Area. The General Accounting Office has identified several high-risk areas in the DoD. This report provides coverage of the Weapon Systems Acquisition high-risk area.

Methodology

Audit Type, Dates, and Standards. We performed this program audit from September 2000 through June 2001 in accordance with generally accepted Government auditing standards except that we were unable to obtain an opinion

on our system of quality control. The most recent external quality control review was withdrawn on March 15, 2001, and we will undergo an new review.

Use of Computer-Process Data. We did not use computer-processed data to perform this audit.

Use of Technical Assistance. The Technical Director and an operations research analyst from the Quantitative Methods Division, Office of the Assistant Inspector General for Auditing, DoD, assisted in reviewing the ATEC operational assessment and safety confirmation for the WAM program. The Quantitative Methods Division interpreted the test results that ATEC provided. Also, mechanical engineers from the Technical Assessment Division assisted in reviewing the technical requirements in the required operational capability document, the test and evaluation master plan, the initial operational test and evaluation report, and the live-fire test and evaluation report.

Contacts During the Audit. We visited or contacted individuals and organizations within the DoD and contractor locations. Further details are available upon request.

Management Control Program Review

DoD Directive 5010.38, "Management Control (MC) Program," August 26, 1996, and DoD Instruction 5010.40, "Management Control (MC) Program Procedures," August 28, 1996, require DoD organizations to implement a comprehensive system of management controls that provides reasonable assurance that programs are operating as intended and to evaluate the adequacy of the controls.

Scope of the Review of the Management Control Program. In accordance with DoD Regulation 5000.2-R, June 10, 2001, acquisition managers are to use program cost, schedule, and performance parameters as control objectives to implement the requirements of DoD Directive 5010.38. Accordingly, we limited our review to management controls directly related to those elements of the WAM program.

Adequacy of Management Controls. We identified a material management control weakness as defined by DoD Instruction 5010.40. Management controls were not adequate for ensuring that the program manager adhered to DoD and Army acquisition regulatory requirements on test and evaluation, acquisition strategy, materiel release, acquisition categories, and overall program management. Recommendation 1., if implemented, will ensure adherence to regulatory requirements. We will provide a copy of the report to the senior official responsible for management controls in the Office of the Assistant Secretary of the Army (Financial Management and Comptroller).

Adequacy of Management's Self Evaluation. Program office officials performed a self-evaluation. However, in their self-evaluation, program office

officials did not identify the specific material management control weaknesses that the audit identified because the self-evaluation did not review for regulatory compliance.

Prior Coverage

During the past 5 years, the General Accounting Office issued three audit reports, and the Inspector General, DoD, issued three audit reports that addressed the WAM program.

General Accounting Office

GAO Report No. GAO-01-607 (OSD Case No. 3075), "Defense Acquisitions: Higher Level DoD Review of Antiarmor Mission and Munitions Is Needed," June 2001

GAO Report No. NSIAD-00-67 (OSD Case No. 1946), "Defense Acquisitions: Antiarmor Munitions Master Plan Does not Identify Potential Excesses or Support Planned Procurements," May 2000

GAO Report No. NSIAD-99-105 (OSD Case No. 1786), "Defense Acquisitions: Reduced Threat Not Reflected in Antiarmor Weapon Acquisitions," July 1999

Inspector General, DoD

Inspector General, DoD, Report No. D-2001-032, "Use of Exit Criteria for Major Defense Systems," January 10, 2001

Inspector General, DoD, Report No. 99-230, "Protection of the Wide-Area Munition Against Radio Frequency Weapons," August 20, 1999

Inspector General, DoD, Report No. 99-143, "Preparation of the Wide-Area Munition For the Year 2000," April 30, 1999

Appendix B. Definitions of Technical Terms

Acquisition Category. An acquisition category is an attribute of an acquisition program that determines the program level of review, decision authority, and applicable procedures. Weapon system acquisition categories consist of I, major Defense acquisition programs; II, major systems; and III, all other acquisition programs. Acquisition Category I programs include two subcategories: Acquisition Category ID programs where the milestone decision authority is the Under Secretary Defense for Acquisition, Technology, and Logistics, and Acquisition Category IC programs where the milestone decision authority is the Component Acquisition Executive. The Component Acquisition Executive is the milestone decision authority for all Acquisition Category II programs.

Acquisition Phase. An acquisition phase represents all the tasks and activities needed to bring a program to the next major milestone. Phases provide a logical means of progressively translating broadly stated mission needs into well-defined, system-specific requirements and, ultimately, into operationally effective, suitable, and survivable systems.

Acquisition Program Baseline. An acquisition program baseline is a document that contains the most important cost, schedule, and performance parameters (both objective and thresholds) for the program. It is approved by the Milestone Decision Authority, and signed by the program manager.

Acquisition Strategy. An acquisition strategy is a business and technical management approach designed to achieve program objectives within the resource constraints imposed. It is the framework for planning, directing, contracting for, and managing a program. It provides a master schedule for research, development, test, production, fielding, modification, postproduction management, and other activities essential for program success. The acquisition strategy is the basis for formulating functional plans and strategies.

Army Acquisition Objective. The Army acquisition objective is the quantity of an item required to equip the approved Army force.

Budget Estimate Submission. The DoD Component's budget estimate submissions to the Office of the Secretary of Defense shows the DoD Component's budget requirements for inclusion in the DoD budget.

Dedicated Operational Test and Evaluation. The dedicated operational test and evaluation is the field test, under realistic conditions, of any item (or key component) of weapons, equipment, or munitions to determine effectiveness and suitability for use in combat by typical military users, and the evaluation of the results of such tests.

Engineering and Manufacturing Development. Engineering and manufacturing development is the third phase of the acquisition process where the program office and its contractors fully develop, engineer, design, fabricate, test, and evaluate the systems and the principal items necessary for support.

Exit Criteria. Exit criteria are program-specific accomplishments that must be satisfactorily demonstrated before a program can progress further in the current acquisition phase or continue to the next acquisition phase.

Full-Rate Production. Full-rate production is contracting for economic production quantities following stabilization of the system design and validation of the production process.

Initial Operational Capability. The initial operational capability is the first attainment of the capability to employ effectively a weapon, item of equipment, or system of approved specific characteristics with the appropriate number, type, and mix of trained and equipped personnel necessary to operate, maintain, and support the system.

Initial Operational Test and Evaluation. Initial operational test and evaluation is that portion of operational test and evaluation on production or production-representative articles conducted to determine a system's operational effectiveness and suitability for intended use by representative users to support the decision to proceed beyond low-rate initial production.

Low-Rate Initial Production. Low-rate initial production is the production of a system in limited quantities to provide articles for additional operational test and evaluation, to establish an initial production base, and to permit an orderly increase in the production rate that will lead to full-rate production after successful completion of operational testing.

Milestone. A milestone is the point where the milestone decision authority decides whether to start or continue an acquisition program in the acquisition process.

Milestone Decision Authority. A milestone decision authority is the individual designated in accordance with criteria established by the Under Secretary of Defense for Acquisition, Technology, and Logistics to approve entry of an acquisition program into the next phase.

Operational Effectiveness. Operational effectiveness is the overall degree of mission accomplishment of a system when used by representative personnel in the environment planned or expected for operational employment.

Operational Suitability. Operational suitability is the degree to which a system can be placed satisfactorily in field use.

Outyear Threat Report. An outyear threat report is a collection of quantitative and qualitative assumptions, estimates, and facts about the threat that will face U.S. and Allied Forces in scenarios specified in the given defense planning guidance during the outyear period. The report presents the Defense Intelligence Agency estimate of enemy capabilities in three levels of detail ranging from types and numbers of weapons to an analysis of expected trends in modernization of weaponry and force structure.

Threshold. A threshold is the minimum acceptable value necessary to satisfy the need.

Appendix C. Wide Area Munition Chronology of Events

November 1986	Department of the Army initiated the WAM program.
February 1990	The Army approved the “Wide Area Mine ¹ (WAM) Required Operational Capability (ROC),” which included 15 performance requirements for the Hornet and an additional requirement for the Advanced Hornet. The ROC stated that Soviet and Warsaw Pact forces will remain the most serious threat to the Army from the present to beyond 2015.
February 1990	The Deputy Commander for Armaments and Munitions approved the WAM to enter into the full-scale engineering and development phase.
July 1991	The Director of Combat Developments, Army Engineer School, allowed the WAM Program Manager to degrade WAM performance for extreme weather conditions.
July 1992	The Commandant, Army Engineer School, approved the WAM Cost and Operational Effectiveness Analysis Main Report which stated that the primary projected threat had been greatly overcome by events.
March 1995	The Program Executive Officer, Armored Systems Modernization, approved the acquisition strategy that showed a total program acquisition objective of 33,799 units.
June 1996	The Program Executive Officer, Armored Systems Modernization, approved a revised acquisition strategy that showed a total program acquisition objective of 33,991 units.

¹On May 17, 1996, the Deputy Chief of Staff for Operations approved the request of the Army Training and Doctrine Command to change the name of the program to Wide Area Munition.

June 1996	The Program Executive Officer, Armored Systems Modernization, approved the Hornet program for low-rate initial production and authorized continuation of the development of the Advanced Hornet.
June 1996	The Program Executive Officer, Armored Systems Modernization, approved the Acquisition Program Baseline Agreement for the Hornet that states that the average threshold unit cost is \$38,100 and total procurement quantities are 33,991.
May 1998	The Army approved the revised Test and Evaluation Master Plan for the Hornet. The master plan did not include a requirement for ATEC to perform operational testing on a production or production-representative article under realistic (combat) conditions.
May 1999	The ATEC confirmed that the Hornet was safe to store, transport, handle, and employ.
July 1999	The Director, Operational Test and Evaluation, issued the report, "Live Fire Test and Evaluation of the XM-93 Hand-Emplaced Wide Area Munition (HE-WAM)," which concluded that the Hornet was not effective out to its required range and was only marginally effective at half the required range.
April 2000	The ATEC issued the report, "System Evaluation Report For Materiel Release of the Hand Emplaced – Wide Area Munition (HE-WAM)," which concluded that the WAM was not operationally effective, but was operationally suitable.
May 2000	At the direction of the program office, the prime contractor began submitting cost performance reports without budget information to measure contractor performance.
October 2000	The Deputy Chief of Staff for Intelligence validated the WAM System Threat Analysis Report which stated that, before 1990, the threat environment of concern was a war against combined Russian and Warsaw Pact forces in Central Europe.
November 2000	The Army Acquisition Executive became the milestone decision authority for the WAM program.

December 2000	The program manager requested conditional materiel release of Hornet.
February 2001	The Assistant Deputy Chief of Staff for Logistics, Army Forces Command, signed the Urgency of Need Statement for the conditional materiel release of the Hornet to the 82nd Airborne Division.
March 2001	The Commander, Army Tank-automotive and Armaments Command, approved conditional materiel release of Hornet to the 82nd Airborne Division.
April 2001	The Director, Combat Requirements, Army Engineer School, allowed the WAM Program Office to use a radio other than the Single Channel Ground and Airborne Radio System to satisfy the communication requirement of the Advanced Hornet.

Appendix D. Expected Performance

The ROC defines a 70-percent success rate for the Hornet in all employment patterns. However, on July 22, 1991, the Director of Combat Developments, Army Engineer School, agreed with the WAM Program Manager to allow WAM operational performance degradations for extreme weather conditions that the Army estimated would occur 20 percent of the time. Accordingly, the WAM 70-percent success rate would only apply 80 percent of the time. Therefore, the expected performance of the Hornet under all environmental conditions is 58 percent. We calculated the expected performance rate as follows:

Midpoint Accuracy: Represents midpoints within their respective categories of no degradation, up to 50-percent degradation, and over 50-percent degradation. For example, .85 is the midpoint between 70 percent and 100 percent (threshold level) in the no degradation category.

Employment Condition: No degradation, up to 50-percent degradation, and more than 50 percent degradation, are given conditions under which employment will occur.

Occurrence Probability: Stated probability of an employment condition occurring.

Minimum Success Rate by Employment Pattern: 70 percent

Expected Overall Performance is:

(Midpoint Accuracy .85) x (Occurrence Probability .80) x (Success Rate .70) +

(Midpoint Accuracy .75) x (Occurrence Probability .19) x (Success Rate .70) +

(Midpoint Accuracy .25) x (Occurrence Probability .01) x (Success Rate .70) = .58

Midpoint Accuracy	0.85	0.75	0.25	
Employment Condition	No Degradation	Up to 50% Degradation	Over 50% Degradation	Expected Overall Performance
Occurrence Probability	0.80	0.19	0.01	
Success Rate	.70	.70	.70	
Employment Pattern:				
Gauntlet	0.47	0.10	0.01	0.58
X- Pattern	0.47	0.10	0.01	0.58
Overwatch	0.47	0.10	0.01	0.58

Appendix E. Wide Area Munition Performance Requirements

The following table lists the results of operational tests of the Hornet against performance requirements in the ROC as shown in the ATEC "System Evaluation Report For Materiel Release of the Hand Emplaced – Wide Area Munition (HE-WAM)," April 2000.

Performance Requirements. The ROC required that the Hornet perform with a 70-percent success rate. It also established 16 operational performance requirements for the WAM. The first 12 performance requirements pertain to both the Hornet and the Advanced Hornet. Requirements 13, 14, and 15 pertain to only the Hornet. The ROC designated 5 of the 15 performance requirements as specific critical functional objectives. The last performance requirement in the ROC pertained to the Advanced Hornet only. The System Evaluation Report showed that the Hornet met 5 of the 15 performance requirements (33 percent). The remaining 10 performance requirements either were partially met (6), not met (2), or not tested (2). Moreover, ATEC stated that the Hornet did not achieve one of the five specific critical functional objectives; that is, a self-destruct just before the end of the battery's life.

The specific critical functional objectives are highlighted in italics.

Performance Requirements	Met	Partially Met	Not Met	Not Tested
1. <i>Will automatically search, detect and recognize moving targets using top attack at a standoff distance of at least 100 meters in a circle around the mine.</i> ¹		X ²		
2. <i>Given a target within a kill radius of 100 meters, the probability of either a mobility³ or a firepower⁴ kill or both must be at least (number is classified).</i>		X ⁵		
3. Will attack all vehicles (targets and non-targets) if they approach the mine with a closest point of approach of 15 meters or less.			X ⁶	

¹Performance requirement should not be construed to imply that every target will be engaged at the periphery of Hornet attack circle.

²The Hornet partially met this performance requirement because it did not attain the contract performance goal for all targets.

³A mobility kill is achieved by the Hornet destroying one or more of the vehicles' vital drive components causing the target to be immobilized.

⁴A firepower kill is achieved by the Hornet destroying either the weapon system or crew.

⁵The Hornet partially met the performance requirement because the Hornet test units did not meet the probability of kill for two of the four targets tested. Also, Hornet performance did not meet the requirement for any of the targets beyond 50 meters.

⁶ATEC concluded that the Hornet did not meet the requirement. Also, the program manager's Hornet get-well plan, issued in support of a conditional materiel release decision, indicated that the requirement was not met.

Performance Requirements	Met	Partially Met	Not Met	Not Tested
4. Have the capability to be deployed and function on slopes of 15 degrees or less (27 percent slope); terrain surfaces ranging from soft (loose and wet soils and snow) to hard (pavement and frozen ground); and in all non-urban and non-forested areas.		X ⁷		
5. Not require special tools or support equipment and be supportable by standard tools and test measurement and diagnostic equipment.	X			
6. <i>Be capable of at least one time remote (coded radio signal) turn on and command destruct and a multiple self-destruct capability up to the maximum battery life.</i>	X			
7. <i>In all destruct modes (disturbance, command destruct, timeout, and low voltage detect) the ground platform electronics and the sublet will be destroyed to preclude enemy use of the Hornet or compromise of sensitive target algorithms or components.</i>		X ⁸		
8. Must have field selectable self-destruct time that includes, as a minimum, those times consistent with the family of scatterable mines.	X			
9. Must be carried/emplaced by one man when removed from its package.	X			
10. Be capable of being deployed by being dropped from a moving 5-ton dump truck and M548 cargo carrier going no faster than 20 miles per hour over secondary roads is desired.				X ⁹
11. <i>If a self-destruct is not set at time of employment, the Hornet must have a life, after activation (command on and manual arming), of at least 30 days; desired 180 days. Will self-destruct just prior to battery life expenditure. Active life of the mine will be traded off against cost and reliability.</i>			X ¹⁰	

⁷ATEC did not test the terrain requirement because the testers were prohibited from crossing hard-surface roads while on foot and in Mission Oriented Protective Posture Level IV for safety reasons. The tests did show that the Hornet ground platform could successfully perform all of its mission-essential functions on slopes of up to 15 degrees.

⁸All Hornets, that successfully functioned in the destruct modes, erased the ground platform electronics. However, if the Hornet failed to function in the destruct mode, it did not erase sensitive target algorithms.

⁹ATEC did not address the performance requirement in the System Evaluation Report.

¹⁰ATEC concluded that the performance requirement was not met.

Performance Requirements	Met	Partially Met	Not Met	Not Tested
12. Will have explosive ordnance and users must have the ability to render the Hornet safe for disposal.				X ¹¹
13. Must have manual arming capability. The safe separation time will be 5-6 minutes.		X ¹²		
14. Must have a remote control arming capability. The safe separation time will be 30-35 minutes. Remote arming will not occur sooner than the safe separation times.		X ¹³		
15. Must be remotely controlled using the M71 Modular Pack Mine System remote control unit.	X ¹⁴			
16. Follow-on capabilities (Advanced Hornet): a. Will be capable of multiple remote turn ON and OFF, with status confirmation (two-way communication), estimated FY 1997. b. Will be capable of controlling other similar mines for target selection and firing, resulting in a coordinated attack, estimated FY 1997. c. In its ultimate configuration, will be capable of sending target sensing and engagement data to friendly forces, estimated FY 1997.				X ¹⁵

Other Requirements. In addition to performance requirements, the ROC included the following requirements for environmental and logistical considerations.

- The hand-emplaced WAM will be used by personnel in standard battle dress, arctic clothing, and in Mission Oriented Protective Posture Level IV gear. In its packaged configuration, the WAM will be stored in hot, basic, and cold climatic conditions. The WAM must operate in limited visibility conditions such as smoke, fog, battlefield dust, rain, and snow.

¹¹ATEC did not address the requirement in the System Evaluation Report. However, the Army Materiel Command issued a memorandum on May 15, 2000, to attest to the safety of the Hornet.

¹²Performance requirement was partially met. Specifically, the system did not meet its manual arming reliability exit criteria. However, it did meet its manual safe separation time. The requirement pertains to the Hornet only.

¹³Performance requirement was partially met. Specifically, the system did not meet its remote arming reliability exit criterion. However, it did meet its remote safe separation time. The requirement pertains to the Hornet only.

¹⁴The requirement pertains to the Hornet only.

¹⁵The performance requirement applies to the Advanced Hornet, that ATEC did not test because the program was still in the engineering and manufacturing development phase.

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- In a packaged configuration, the hand-emplaced WAM will not cause any restrictions that would preclude transportation by any type aircraft, ship, rail, highway, wheeled and tracked vehicles.
 - Nuclear, biological, and chemical contamination survivability is required in its packaged configuration.

Appendix F. Audit Response to Management Comments Concerning the Report

Our detailed responses to the comments from the Director, Strategic and Tactical Systems, and the Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) on statements in the finding of the draft report follows. The complete text of those comments is in the Management Comments section of this report.

Management Comments. The Director, Strategic and Tactical Systems, and the Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) provided comments that specifically addressed cost and schedule growth, changes to requirements, operational effectiveness, testing for safety, the threat, program documentation, and acquisition category. The following discusses those specific comments and the audit response.

Cost and Schedule Growth. The Director, Strategic and Tactical Systems, stated that while some degree of cost growth has occurred, the unit cost figures in the draft report were misleading. He stated that the program cost projection in the draft report used a unit cost figure from the 1990 ROC, that was developed before the start of the engineering and manufacturing development phase. He stated that the 1990 ROC figure (adjusted to FY 2000 dollars) when compared to the recent FY 2000 unit cost estimate, showed an increase of 150 percent. He also stated that funding reductions early in the engineering and manufacturing development phase resulted in a schedule slip of 3 years and that further development efforts to correct technical and performance problems contributed to schedule slips.

The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) stated that the WAM program was subjected to significant Congressionally-directed funding reductions in the first 2 years of the engineering and manufacturing development phase that caused program slippages beyond the control of the WAM Program Manager. He further stated that program manager did everything possible to minimize the effect of the funding reductions on cost and schedule.

Audit Response. We asked the Director, Strategic and Tactical Systems, to provide the assumptions he used in his calculations that the cost increase was limited to 150 percent of the original unit cost. He referred us to the WAM Program Office which stated that they based the calculation on an inflation-adjusted unit cost that assumed a production rate of 4,000 units per year. The production rate of 4,000 units per year, however, is not consistent with the budget estimate submission provided to Congress that showed an average production rate of 496 units per year from FY 2000 through FY 2007. An adjustment for inflation, however, is appropriate. Accordingly, we have revised our calculations to reflect an original unit cost of \$13,145, as inflated to FY 2000 dollars. Using the original unit cost, as inflated to FY 2000 dollars, WAM unit costs have increased by 330 percent instead of 500 percent as stated in the draft report. We modified this final report accordingly.

Further, we recognize that program funding reductions for the first 2 years in the engineering and manufacturing development phase affected the program schedule. However, developmental efforts to correct Hornet technical and performance problems were the primary contributors to the schedule slips identified in the Finding. To illustrate, the milestone decision authority approved the acquisition program baseline in June 1996. Because of Hornet technical and performance problems identified in testing, the milestone decision authority has yet to hold the Hornet full-rate production decision that was specified for May 1998 in the June 1996 acquisition program baseline.

Changes to Requirements. The Director, Strategic and Tactical Systems, and the Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) stated that they used the cost as an independent variable principle for decision-making. Further, the Director, Strategic and Tactical Systems stated that the WAM Program Manager and the user representative negotiated and approved all changes to WAM operational performance requirements using the cost as an independent variable principle.

Audit Response. The most significant changes to Hornet operational performance requirements concerned degradation of Hornet operational performance in extreme weather conditions and the elimination of the need for the Hornet to engage wheeled vehicles. The user representative approved documents for the changes but did not indicate that changes to the operational performance requirements resulted from using cost as an independent variable principle. The Under Secretary of Defense for Acquisition and Technology approved program manager use of cost as an independent variable principle in December 1995.

The user representative approved the Hornet weather-related performance degradations in July 1991 showing that the Hornet could not perform under extreme weather conditions. Similarly, the Army Director of Requirements, Office of the Deputy Chief of Staff for Operations and Plans, did not reference the use of cost as an independent variable principle when approving the deletion of the Hornet operational performance requirement to engage heavy wheeled vehicles on May 17, 1996. Instead, the Director of Requirements stated that the requirement was deleted because the primary use of the Hornet was to protect early entry forces against tanks and other tracked armored vehicles. The operational requirement for the Hornet to engage wheeled vehicles was deleted after test results showed that the Hornet, as designed, could not perform as required against wheeled vehicles.

Operational Effectiveness. The Director, Strategic and Tactical Systems, stated that the original operational scenarios for the WAM were revised by the user during engineering and manufacturing development, but the ROC was not updated. With respect to the revised operational scenarios, he stated that the WAM met 12 of the 15 operational performance requirements. He further stated that the remaining WAM shortcomings were documented in the get-well plan supporting the conditional material release that the user accepted.

The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) stated that ATEC determined that the basic WAM was not

operationally effective because it did not meet its single shot probability of kill requirement. However, he stated that ATEC concluded that the basic WAM “achieved the mission performance objectives of the 82nd Airborne [Division] for most targets of interest” and supported type classification limited procurement and conditional materiel release for use by the 82nd Airborne Division. He further stated that the basic WAM met all of its operational performance requirements except for those identified in the get-well plan supporting the conditional materiel release.

Audit Response. The approved ROC is the baseline that ATEC used to test the basic WAM to determine whether the test results demonstrated that the basic WAM met the ROC operational performance requirements. Because the Army user representative did not update the ROC to state the revised Army needs, there is no assurance that ATEC tested the basic WAM in the most effective and efficient manner.

Although the management comments indicated that the basic WAM “achieved the mission performance objectives of the 82nd Airborne [Division] for most targets of interest,” the 82nd Airborne Division stated that it was not aware that the basic WAM, as designed, could not attack wheeled vehicles when it accepted the conditions for the conditional release of the basic WAM. The 82nd Airborne Division stated that the WAM performance requirement against wheeled vehicles was mission essential. Without that capability, the 82nd Airborne Division stated it would rather use weapon systems that were already in the Army warfighting inventory that were capable of functioning against wheeled vehicles.

Further, the get-well plan that the WAM Program Manager prepared to support the conditional release of the basic WAM did not identify all ROC weapon system performance deficiencies associated with the basic WAM and did not address the associated corrective action(s). Specifically, the get-well plan did not identify the inability of the basic WAM to satisfy its self-destruct requirement and the ability of the basic WAM to only partially satisfy the requirements for arming reliability in both the manual and remote arming modes.

Testing for Safety. The Director, Strategic and Tactical Systems, stated that the basic WAM was subjected to the full spectrum of typical safety and performance tests. He also stated that the Deputy Under Secretary of the Army for Operations Research concurred that ATEC had conducted sufficient testing to confirm the safety of the basic WAM.

The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) stated that throughout the development process appropriate tests were conducted to ensure the safety of the basic WAM. He stated that numerous independent organizations were involved in the evaluation and approval cycle of the basic WAM to ensure its safety and suitability. He listed the following organizations: the Surgeon General, the Army Center for Health Promotion and Preventive Medicine, the Army Research Laboratory, the Army

Safety Center, ATEC, and the Army Fuze Safety Board. In addition, he stated that the Deputy Under Secretary of the Army for Operations Research concurred that:

- ATEC had sufficient test results to justify the safety confirmation and
- the Army performed all necessary testing to ensure that typical Army users could safely use the basic WAM.

Audit Response. We disagree that the test results available to ATEC were sufficient to confirm that the basic WAM units were safe to use by personnel of the 82nd Airborne Division. Specifically,

- Instead of using live munitions to conduct basic WAM operational tests, ATEC used inert trainers that were the same configuration as the live munition with respect to size, weight, and appearance but did not contain high explosives.
- ATEC noted in its test report that the use of inert trainers detracted from the realism of the test. The soldiers' knowledge that inert trainers were used, removed the stress connected with working with live munitions.
- The Army did conduct developmental tests using live munitions. However, the munitions were armed using a remote arming fixture rather than by soldiers as would be performed in an operational environment.
- Sample sizes used by ATEC to determine that the basic WAM was safe to store, transport, handle, and employ were too small. Based on the sample sizes selected, ATEC may have drawn an incorrect conclusion concerning the ability of operational users to safely store, transport, handle, and employ the basic WAM.

Accordingly, we continue to believe that the Deputy for Munitions, Office of Strategic and Tactical Systems, should assess the safety of the basic WAM for use by the 82nd Airborne Division personnel as part of the review of the WAM program.

Threat. The Director, Strategic and Tactical Systems stated that the WAM System Threat Assessment Report was updated in May 2001, and it supports the need for the WAM. He stated that a more detailed assessment was needed to validate the requirement (the number needed) for WAM.

The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) stated that the WAM System Threat Assessment Report was updated regularly every 2 years and the report continued to show significant threats that WAM was designed to defeat. He also stated that the WAM supports the Interim Brigade Combat Teams and all Army formations by providing them with a lightweight, versatile, lethal capability not currently available.

Audit Response. We agree that the updated WAM System Threat Assessment Report identifies significant, but greatly diminished, threats for which WAM was designed to defeat. However, the updated report did not take into account, as part of the threat assessment, the large number of weapons that DoD already has in its inventory to defeat the threat. As stated in the finding, the “Wide Area Mine Cost and Operational Effectiveness Analysis Main Report,” July 1992, states that the primary projected threat for the WAM had been greatly overcome by events. Moreover, the General Accounting Office also concluded in 1999, that the threat of a massive, heavily armored attack by potential enemies had greatly diminished. The General Accounting Office further stated that DoD has a large inventory of about 40 different types of antiarmor weapons and it is currently funding 13 new antiarmor weapons, including the WAM, to defeat the diminished threat.

Accordingly, we continue to believe that the Deputy for Munitions should assess not only WAM requirements (the number needed) but also the diminished threat, and demonstrated WAM capabilities to determine whether DoD needs to continue development and procurement of the WAM as part of the review of the WAM program. As stated earlier, the 82nd Airborne Division stated that the WAM performance requirement against wheeled vehicles was mission essential. Without that capability, the 82nd Airborne Division stated it would rather use weapon systems that were already in the Army warfighting inventory that were capable of functioning against wheeled vehicles. As of September 2001, the WAM contractor had not demonstrated that the Hornet or the Advanced Hornet was capable of defeating wheeled vehicle threats, a mission essential requirement for operational users.

Program Documentation. The Director, Strategic and Tactical Systems, stated that the WAM test and evaluation master plan was updated at each milestone decision point and was last updated in May 1998. He stated that the acquisition strategy was updated in 1996 to support the low-rate initial production decision and was being updated for the Advanced Hornet program. He agreed that a more thorough review was needed to assess the adequacy of those documents.

The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) also stated that the WAM Program Manager updated and received approval for the test and evaluation master plan and the acquisition strategy at each milestone decision point as required.

Audit Response. Although the WAM Program Manager updated and received approval for the test and evaluation master plan and the acquisition strategy at each milestone decision point as required, the documents were not prepared or updated in accordance with requirements in DoD Regulation 5000.2. Specifically, the test and evaluation master plan did not include plans to conduct operational testing to support WAM production decision points as required, and the acquisition strategy was not updated to show how the WAM Program Office planned to achieve a significant increase in the Army acquisition objective.

Acquisition Category. The Director, Strategic and Tactical Systems, stated that the approved 1996 acquisition program baseline for the WAM program identified a total procurement cost threshold of \$1.18 billion, based on a procurement quantity of 33,991. Based on the Army current procurement objective of 19,780 WAM units, he stated that the estimated program procurement cost of the WAM program was below the acquisition category I threshold of \$2.19 billion. He also stated that there were indications that the estimated research, development, test, and evaluation cost of the WAM program was close to the acquisition category I threshold of \$365 million. Accordingly, he stated that a more detailed review of the estimated research, development, test, and evaluation cost of the WAM program was required to determine whether the WAM should be an acquisition category I program.

The Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) stated that because the approved procurement objective for the WAM program was less than 20,000 units with a total cost of production of no more than \$1.2 billion, the WAM was correctly categorized as an acquisition category II program.

Audit Response. The Director, Strategic and Tactical Systems, and the Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) were using the Army WAM quantities approved for procurement rather than the Army approved acquisition objective for the WAM, as stated in the Army October 2000 budget estimate submission to Congress, to determine whether the WAM program met criteria as an acquisition category I program. DoD Instruction 5000.2 requires that acquisition programs with an eventual total procurement cost of more than \$2.19 billion be classified as an acquisition category I program. In the case of the WAM program, the Army plans to eventually acquire 53,376 units, its approved acquisition objective, and WAM procurement costs would total about \$3.06 billion. Accordingly, we continue to maintain that the WAM program meets the procurement cost criteria for classification as an acquisition category I major defense acquisition program.

Appendix G. Report Distribution

Office of the Secretary of Defense

Under Secretary of Defense for Acquisition, Technology, and Logistics
Under Secretary of Defense (Comptroller)
 Deputy Chief Financial Officer
 Deputy Comptroller (Program/Budget)
Director, Operational Test and Evaluation

Department of the Army

Assistant Secretary of the Army (Financial Management and Comptroller)
Assistant Secretary of the Army (Acquisition, Logistics and Technology)
Deputy Under Secretary of the Army (Operations Research)
Commander, Army Forces Command
Commander, XVIII Airborne Corps
 Commander, 82nd Airborne Division
 Commander, 307th Engineer Battalion
Commander, Army Test and Evaluation Command
Commander, Army Engineer School
Deputy for Systems Acquisition, Army Tank-automotive and Armaments Command
 Program Manager for Mines, Countermine, and Demolition
Auditor General, Department of the Army

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Senate Subcommittee on Defense, Committee on Appropriations
Senate Committee on Armed Services
Senate Committee on Governmental Affairs
House Committee on Appropriations
House Subcommittee on Defense, Committee on Appropriations
House Committee on Armed Services
House Committee on Government Reform
House Subcommittee on Government Efficiency, Financial Management, and Intergovernmental Relations, Committee on Government Reform
House Subcommittee on National Security, Veterans Affairs, and International Relations, Committee on Government Reform
House Subcommittee on Technology and Procurement Policy, Committee on Government Reform

Under Secretary of Defense For Acquisition, Technology, and Logistics Comments



ACQUISITION,
TECHNOLOGY
AND LOGISTICS

OFFICE OF THE UNDER SECRETARY OF DEFENSE

3000 DEFENSE PENTAGON
WASHINGTON, DC 20301-3000

04 SEP 2001

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE
ATTN: DEPUTY DIRECTOR, ACQUISITION
MANAGEMENT DIRECTORATE

THRU: DIRECTOR, ACQUISITION RESOURCES AND ANALYSIS *W2a/1/01*

SUBJECT: Draft of a Proposed Audit Report, "Acquisition of the Wide Area Munition,"
Project No. D2001AE-0011, dated June 27, 2001

Thank you for the opportunity to review and comment on the Draft Audit Report on Acquisition of the Wide Area Munition (WAM). I am only responding to the first of the two recommendations made in the report, since WAM has not received formal oversight from OUSD(AT&L).

Recommendation 1: We recommend that the Under Secretary of Defense for Acquisition, Technology and Logistics conduct a special review of the Wide Area Munition program and determine whether the current program should continue by obtaining and assessing:

- a. data on program cost and schedule growth since program inception;
- b. Advanced Hornet contract cost performance reports to determine the extent of program cost and schedule risks and the potential for further program cost increases and schedule slippage;
- c. documentation that justified changes to the minimum operational requirements of the Hornet and Advanced Hornet;
- d. live-fire and operational test reports to determine whether the program office and contractor have viable plans to correct performance deficiencies identified during testing that affected the successful demonstration of 10 of the 15 operational performance requirements;
- e. the propriety of test documentation that supported the Hornet safety confirmation used to reach conclusions concerning safety of the Hornet;
- f. a current threat analysis to determine the continued need for the Wide Area Munition in view of the reduced threat and other antiarmor systems available to defeat the same threat;



g. the need for a dedicated operational test and evaluation, in the test and evaluation master plan, to ensure that the Wide Area Munition is tested under realistic conditions, to include operation by typical users with live munitions, and battlefield noise;

h. the justification for Wide Area Munition procurement quantities addressed in the program acquisition strategy;

i. the completeness of documentation that supported Army decisions concerning the Hornet conditional materiel release and the get-well plan; and

j. the Army's rationale for not recommending that the program be managed as an Acquisition Category I program as required.

DOD RESPONSE:

In order to be responsive to your request for comments, my staff performed a preliminary review of the WAM program, and their assessment is attached. On the basis of this assessment, and the concerns raised by your findings, I concur that a review is warranted.

I do not concur that the Under Secretary of Defense (Acquisition, Technology and Logistics) should conduct this review. Rather, I will assign my Deputy for Munitions, Mr. Tony Melita, to lead a review team, which will include the Office of the Director for Program Analysis and Evaluation, the Office of the Director for Operational Test and Evaluation, my Deputy for Developmental Test and Evaluation, and the Army's Office of the Deputy Chief of Staff for Operations and Plans.

Our review will focus on confirming the requirement for WAM, determining appropriate Acquisition Category for the program, and assessing the viability of the Army's plans for ensuring the Advanced Hornet meets operational performance requirements.



George R. Schneider
Director
Strategic and Tactical Systems

Attachment:
As stated

Date Prepared: August 27, 2001, 9:00 AM

DoD IG Draft Audit Report
June 27, 2001

“Acquisition of the Wide Area Munition”

Project No. D2001AE-0011

Assessment of the Office of the Under Secretary of Defense
(Acquisition, Technology and Logistics)

- DoD IG Finding: The Army and program office supported the continuation of the program even though unit costs had increased by 500 percent and the schedule had slipped by more than 5 years since program inception.

OUSD(AT&L) Assessment: While some degree of cost growth has occurred, the unit cost figures stated in the Draft Audit Report are misleading. The original unit cost projection used by the DoD IG was a figure from the 1990 Required Operational Capabilities (ROC) document, which was developed prior to the start of Engineering and Manufacturing Development (EMD) of the WAM, a complex, technologically advanced munition system. If the 1990 ROC figure (adjusted to FY00 dollars) is compared to the recent FY00 unit cost estimate, the increase is 150%.

Significant funding cuts early in the EMD phase resulted in a schedule slip of 3 years. Also, further development efforts to correct technical and performance problems contributed to schedule slips.

- DoD IG Finding: The Army allowed changes to the Hornet [WAM] operational performance requirements below those originally established and acceptable by the user.

OUSD(AT&L) Assessment: The Army Project Manager and User Representative negotiated all changes to operational performance requirements using Cost as an Independent Variable (CAIV) principles. All changes were approved by the user.

- DoD IG Finding: The Army operational test organization determined that the Hornet was not operationally effective based on test results that showed that the Hornet met only 5 of the 15 operational performance requirements.

OUSD(AT&L) Assessment: The original operational scenarios for the WAM were revised by the user during EMD, but the ROC was not updated. With respect to the revised operational scenarios, the WAM meets 12 of the 15 operational performance requirements. The remaining shortcomings were

documented in the Conditional Materiel Release Get Well Plan, which was accepted by the user.

- DoD IG Finding: The Army operational test organization did not perform necessary tests before production and deployment of the Hornet to prove that typical Army users could safely store, transport, handle, and employ the Hornet under realistic conditions, such as effects of battlefield noise, even though the Hornet uses acoustic and seismic sensors to detect targets.

OUSD(AT&L) Assessment: The WAM was subjected to the full spectrum of typical safety and performance tests. In a March 12, 2001 memorandum, the Deputy Under Secretary of the Army for Operations Research concurred that there had been sufficient testing to confirm the safety of the Hornet munition.

- DoD IG Finding: The Army did not revalidate the rationale for the continued development of the Wide Area Munition as the related threat had reduced by more than 80 percent since the program began more than 12 years ago.

OUSD(AT&L) Assessment: The WAM System Threat Assessment Report (STAR) was updated in May 2001, and supports the need for the WAM. A more detailed assessment would be required to validate the requirement for WAM.

- DoD IG Finding: The program manager did not properly develop and update the test and evaluation master plan and the acquisition strategy to manage the Wide Area Munition program effectively and make informed decisions.

OUSD(AT&L) Assessment: The WAM Test and Evaluation Master Plan was updated at each milestone decision point and was last updated in May 1998. The Acquisition Strategy was updated in 1996 to support the Low-Rate Initial Production decision and is currently being updated for the Advanced Hornet program. A more thorough review would be required to assess the adequacy of these documents.

- DoD IG Finding: The program manager did not recommend that the Defense Acquisition Executive oversee the Wide Area Munition program as required, even though the program procurement costs will exceed \$3 billion.

OUSD(AT&L) Assessment: The approved 1996 Acquisition Program Baseline identifies a total procurement threshold cost of \$1.18 billion, based on a procurement quantity of 33,991. The Army's current Procurement Objective quantity is 19,780. The estimated program procurement cost of the WAM program is below the ACAT I threshold of \$2.19 billion. There are indications that the estimated RDT&E cost of the WAM program is close to the ACAT I threshold of \$365 million. A more detailed review of program RDT&E costs is required to determine if WAM should be an ACAT I program.

Prepared by: Steve Tretiak, S&TS/Munitions, stefan.tretiak@osd.mil, 703-695-1453

Acting Assistant Secretary of the Army (Acquisition, Logistics and Technology) Comments



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
ACQUISITION LOGISTICS AND TECHNOLOGY
103 ARMY PENTAGON
WASHINGTON DC 20310-0103

28 AUG 2001



SAAL-ZCA

MEMORANDUM FOR INSPECTOR GENERAL, DEPARTMENT OF DEFENSE,
ATTN: DEPUTY DIRECTOR, ACQUISITION
MANAGEMENT DIRECTORATE

SUBJECT: Review of Draft Audit Report on the Acquisition of the Wide Area
Munition (WAM) (Project No. D2001AE-0011)

In response to the draft of the proposed Department of Defense Inspector General report, "Acquisition of the Wide Area Munition," the Army has reviewed each of the findings and provided preliminary comments (Enclosure). While the WAM program certainly has changed over time and has encountered numerous challenges, the Army has maintained sufficient oversight and exercised prudent financial management. Our findings also indicate that the draft audit left out the following critical information: "The Deputy Under Secretary of the Army (Operations Research) concurs with the Army Test and Evaluation Command that sufficient testing had been completed to deem the WAM safe to employ."

After careful consideration and in discussion with the United States Army Tank-automotive and Armaments Command, the Army non-concurs with your findings. If you so desire, my staff would like to schedule a meeting with your auditors to review the audit information and bring clarification to your findings.

Point of contact for this action is Mr. Gerald Schwartz, (703) 617-5899.

Kenneth J. Oscar
Acting Assistant Secretary of the Army
(Acquisition, Logistics and Technology)

Enclosure

DOD IG DRAFT AUDIT REPORT
JUNE 27, 2001

ON THE ACQUISITION OF THE WIDE AREA MUNITION
PROJECT No. D2001AE-0011

ASSESSMENT OF THE ASSISTANT SECRETARY OF THE ARMY
(ACQUISITION, TECHNOLOGY AND LOGISTICS)

DOD IG Finding: On the finding that the Army and the program office supported continuation of the program in spite of cost and schedule slips.

The WAM program was subjected to significant Congressionally-directed funding reductions in the first two years of the engineering, manufacturing, and development program which caused program slippages beyond the control of the Project Manager. The Project Manager did everything possible to minimize the effect on cost and schedule, including being one of the first programs to use the integrated product team and alpha contracting team approach to run the program as efficiently as possible to handle technical problems associated with one of the first highly sophisticated, multi-mode sensing, state-of-the-art precision munition program.

DOD IG Finding: On the finding that the Army allowed changes to the Hornet operational performance requirements below those originally established and acceptable by the user, the Army non-concurs.

During the development process the Army made changes to the operational requirements using the cost as an independent variable (CAIV) principle. The CAIV principle was used during the WAM development program to ensure that requirements were technically achievable and affordable. Funding was allocated to those requirements deemed most critical to the Army.

DOD IG Finding: On the finding that the Army independent test organization determined that the Hornet was not operationally effective; the Army concurs in part.

ATEC did find that Basic WAM was not operationally effective because it failed to meet its single shot Probability of Kill criteria. However, because of an urgent operational requirement, Army Test and Evaluation Command (ATEC) also evaluated the Basic WAM against scenarios specific to the 82nd Airborne Division. ATEC found that Basic WAM "achieved the mission performance objectives of the 82nd Airborne for most targets of interest" and supported type classification limited procurement and conditional materiel release for use by the 82nd Airborne. The Basic WAM has met all of the requirements except for those identified in the Conditional Materiel Release get well plan which was approved by the TACOM commander on

16 March, 2001, and those requirements are expected to be addressed during the development of the Advanced Hornet program.

DOD IG Finding: On the finding that the Army independent test organization did not perform necessary tests before production and deployment of the Hornet to prove that typical Army users could safely store, transport, handle, and employ the Hornet under realistic conditions, the Army non-concurs.

Throughout every step of the WAM development process appropriate tests were conducted to ensure the safety of the item. Numerous independent government agencies have been involved in the evaluation and approval cycle of the WAM to ensure its safety and suitability. A short list of them includes the Surgeon General, the Army Center for Health Promotion and Preventive Medicine, the Army Research Lab, the Army Safety Center, the Army Test and Evaluation Command and the Army Fuze Safety Board. On March 12, 2001, the Deputy Under Secretary of the Army (Operations Research) concurred with the Army Test and Evaluation Command's position that sufficient testing had been completed to justify safety confirmation of the WAM and that the Army performed all necessary testing to ensure that typical Army users could safely use the WAM munition.

DOD IG Finding: On the finding that the Army did not revalidate the rationale for the continued development of the WAM as the related threat had significantly reduced since the end of the Cold War, the Army non-concurs.

The WAM System Threat Assessment Report has been updated regularly every two years and the report continues to show significant threats for which WAM was designed to defeat. The WAM supports the Interim Brigade Combat Teams and all Army formations by providing them with a lightweight, versatile, lethal capability not currently available.

DOD IG Finding: On the finding that the program manager did not properly develop and update the test and evaluation master plan and the acquisition strategy, the Army non-concurs.

The Project Manager updated and received approval for the Test Evaluation Master Plan and acquisition strategy at each milestone per DOD 5000 guidance.

DOD IG Finding: On the finding that the program manager did not recommend that the Defense Acquisition Executive oversee the WAM program as required, the Army non-concurs.

Rationale is based on the fact that the Approved Procurement Objective (APO) for WAM is less than 20,000 with a total cost of production of no more than \$1.2 Billion. As production cost is less than \$2.19 Billion, and since this is not a special interest item, it is an ACAT II program. Therefore, the program remains an Army oversight program.

DOD IG Finding: On the recommendation that the Program Manager for the Wide Area Munition immediately validate Hornet requirements for the 82nd Airborne Division and adjust procurement quantities.

The TRADOC Systems Manager (TSM) revalidated the need for 377 WAM munitions. The TSM restated that 270 basic Hornets are considered the basic load per combat engineer battalion. A basic load is the amount of ammunition a unit needs for one engagement and usually represents one to three days worth of supply. Two hundred and seventy munitions represent an initial capability for the unit's requirement for a campaign, but definitely not the total requirement. In January 2001, the Program Manager (PM) received acknowledgement from the 82nd Airborne Division accepting the conditions for the WAM materiel release, with the understanding that Hornet provides a capability that is urgently needed within the Division. On July 9, 2001, the PM received a letter from HQ, U.S. Army Forces Command, reiterating their urgent need for Hornet.

Audit Team Members

The Acquisition Management Directorate, Office of the Assistant Inspector General for Auditing, DoD, prepared this report. Personnel of the Office of the Inspector General, DoD, who contributed to the report are listed below.

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